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# Extreme working hours in Western Europe and North America: A new aspect of polarization

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# Extreme working hours in Western Europe and North America: A new aspect of polarization

Anna S. Burger\*

## Abstract

This paper analyzes the trends and root causes of extreme working hours in sixteen Western European countries, Canada, and the United States between 1970 and 2010. Earlier literature has revealed increasing trends in extreme working hours in the United States and recognized the negative repercussions of this new aspect of labor market polarization. As European average working hours have declined over the past decades, scholars have turned little attention to the analysis of extreme working hours in European countries. First, the article documents diverging patterns of extreme working hours in Western Europe. Whereas the Scandinavian and French ratios of workers with extreme hours remained very low, most other countries in Western Europe exhibit significantly higher ratios of extreme workers after the beginning of the 1990s than in the previous two decades. Second, the article detects the development of two diverging trajectories in the advanced capitalist world: one with a strong and stable labor regulation along with a balanced working hour profile and one with gradual deregulation along with an increasing ratio of long work weeks. Finally, using a series of pooled cross-section OLS estimations, the article tests five specific hypotheses, motivated by theories of the welfare state and political economy theories of globalization. The results provide strong empirical evidence for the notion that patterns of extreme working hours are not inherent in post-industrial development. The article uses data from the author's extreme working hours standardized meta-database which had been compiled from two large micro data collections: the Luxembourg Income Study database (LIS) and the Multinational Time Use Study (MTUS).

**Keywords:** extreme working hours, working hour polarization, working hour inequality, labor regulation, welfare state

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# Table of Contents

1. Introduction	1
2. Literature review	3
2.1 Patterns of extreme working hours in advanced capitalist societies	3
2.2 Root causes of diverging patterns: the effects of welfare state reform and of economic globalization	5
3. Data	11
4. Specific hypotheses	12
5. Empirical results	13
5.1 Main trends: Patterns of extreme working hours	13
5.2 Regression analysis: The root causes of diverging patterns	19
5.3 Robustness check: Alternative model specifications	25
6. Conclusion	27
References	29
Appendices A-D	32

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# **Extreme working hours in Western Europe and North America: A new aspect of polarization**

## **1. Introduction**

In the second half of the 19th century, scholars were increasingly concerned about the issue of working time. The sources of and the potential policy responses to the high prevalence of unpaid overtime throughout the unfolding of the Industrial Revolution were widely discussed among scholars and policy makers of the time. The legal limitation of the working day to an eight-hour day was one of the most important demands of the early social-democratic and labor movements in Europe. The eight-hour day or 40-hour week movement was an answer to dramatically changing working conditions in the period of transformation from agricultural production to a predominantly industrial market structure. Before the first labor regulations were enacted, working days had been often extended to twelve or fourteen hours for six days a week at the discretion of the employer. By the first decades of the 20th century, trade unions were organized and strict working time regulation was successfully enacted in most Western European countries. Therefore the topic seemed less relevant and received less focus in social science research throughout the middle and the second half of the 20th century. Then in 1991, when Juliet Schor published *The Overworked American*, in which she showed evidence that US-Americans were spending

significantly more time at paid work in the late 1980s than they had been in the late 1960s, the topic of working time received renewed interest. Schor's revelation was surprising, and at the same time disappointing, as it suggested that the fruits of technological advancements were again not used in a labor friendly way and that the level of redistribution was inadequate. Schor estimated that, on average, US-American men worked almost 100 hours more while women worked 300 hours more in 1987 than in 1969, all this against the backdrop of a generally increasing economic productivity level. Her findings triggered a still ongoing debate on whether and why this trend is happening. This paper adds to the literature by taking a systematic empirical inquiry into the patterns and determinants of extreme working hours (conceptualized and operationalized as weekly 50 hours or more) in eighteen advanced capitalist countries in Western Europe and North America since the 1970s.

First, my results suggest that extreme working hour patterns of many European countries have been converging towards the US-American pattern: an increasing ratio of European workers are overworked since the beginning of the 1990s. On the other hand, a small number of countries, in particular, France and the Scandinavian countries, seem to have been able to maintain a balanced work profile during the decades of transition from industrial production to service-oriented post-industrialism. Second, I document diverging trends across subpopulations of different educational and gender categories. Finally, using a series of pooled cross-section OLS estimations, I argue that the extent and direction to which a welfare state has been adapted to the post-industrial environment plays a significant role in the evolution of advanced capitalist countries' extreme working hour profiles. Strong welfare states have been much more successful in hampering the development of a further polarization of their labor force than weaker welfare states.

The remainder of this paper proceeds as follows. The next section summarizes earlier literature on the patterns and root causes of extreme working hours in advanced capitalist societies. Section 3 introduces the data used in the empirical analysis. Section 4 connects the theoretical and empirical part of the analysis by presenting a list of specific hypotheses. Section 5 contains the main empirical results. Finally, Section 6 concludes.

## 2. Literature review

### 2.1 Patterns of extreme working hours in advanced capitalist societies

The first main goal of this study is to conduct a comparative analysis of the developments of extreme working hours in sixteen Western European countries, the United States and Canada since the 1970s. Previous work on working hours concentrates mostly on patterns of average working hours in the United States (Clarkberg and Moen 2001; Coleman and Pencavel 1993a,b) and Western Europe (Alesina et al. 2005; Ausubel and Grübler 1995; Golden and Figart 2005) and on patterns of extreme working hours in the United States (Jacobs and Gerson 1998). As European average working hours stagnated or declined over the past decades, scholars of working time have turned little attention to the analysis of extreme working hour patterns in European countries.

Following the publication of *The Overworked American* (Schor 1991), labor market researchers dived into empirical inquiries using time-use data and various population surveys to find out whether the century-long decline in

working time in the United States has indeed been reversed. Depending on the method applied and the data source used, empirical results vary to some extent. However, most studies confirm the hypothesis that the average length of weekly and yearly working hours in the United States has increased or stagnated since the 1970s (Clarkberg and Moen 2001; Coleman and Pencavel 1993a,b; Hochschild 1997; Leete and Schor 1994), whereas the average length of weekly and yearly working hours in Western European countries has declined or stagnated (Alesina et al. 2005; Ausubel and Grübler 1995; Golden and Figart 2005). Jacobs and Gerson (2004) have revealed a new macro-trend of bifurcation of working time in the United States: their empirical analysis shows that very long and very short work weeks have increased in the United States since the 1990s. Based on their analysis conducted on US Current Population Survey data, they argue that today there is an ever-increasing number and ratio of employees who are overworked and underworked in the United States and that the prevalence of extreme weekly working hours has particularly increased among employees with college degrees. According to their estimations, 39% of men and 20% of women with college degrees worked more than 50 hours a week in 2000. The incidence of extreme working hours among various socio-economic subcategories of the US-American population has also been examined in the past. For example, Goldin, and Katz (2010) and Hewlett and Luce (2006) argue that extreme working hours have become so prevalent in the corporate and financial sectors that in the years following graduation, highly skilled women gradually leave high-powered positions to settle for other occupations where they can combine family and career responsibilities.

The literature knows much less about the patterns of extreme working hours in Western European countries. The only international comparison of



extreme working hour ratios was conducted by Jacobs and Gerson (1998), who make a cross-section comparison of extreme working hour ratios across six European countries, Australia, Canada, and the United States, using data from the second wave (1989-1992) of the Luxembourg Income Study (LIS). They find that the ratio of extreme workers was higher in Australia and the United States than in any of the six European countries observed. Based on their analysis, they conclude that the US-American pattern of working time bifurcation has not been replicated in most other affluent societies. They argue that Europeans were able to maintain a high and growing standard of living with a very different work profile than is evident in the United States.

While Jacobs and Gerson's snapshot view from the beginning of the 1990s might corroborate earlier findings based on the analysis of average working hour trends, I argue that ongoing and subsequent changes in global economic structures and national labor regulations call for a more detailed analysis of extreme working hour trends in Europe, focusing both on the cross-section as well as the longitudinal aspects of the trends. This article reveals diverging trends across Western European countries: it finds that the working hour profile of many European full time workers, particularly those with high-skills, have been converging towards the US-American pattern since the beginning of the 1990s.

## 2.2 Root causes of diverging patterns: the effects of welfare state reform and of economic globalization

The second main goal of this study is to investigate the root causes of diverging post-industrial patterns of extreme working hours, relying on

## Extreme working hours

theories of the modern welfare states and political economy theories of globalization.

A number of scholars concentrate on questions of welfare regime adaptability and diverging trajectories in terms of social outcomes, including various aspects of work-life balance. Although many scholars and policy practitioners are skeptical about the notion that social protection systems can be recalibrated so that they can adapt to the new post-industrial environment, a thorough literature review on the topic of welfare state adaptability (Häusermann and Palier 2008) shows that the strong Scandinavian welfare states have indeed been able to recalibrate their labor markets in an employment and family friendly way in numerous waves over the past decades while liberal labor markets continued to deregulate their markets as a response to global economic challenges. Western European countries seem to have followed diverging reform trajectories with mixed outcomes. As the academic community is divided as to the evaluation of these mixed outcomes, a number of important questions have remained open. Are there clear diverging trajectories among continental European countries in terms of reform directions and welfare outcomes, such as working hour outcomes? To what extent have these countries engaged in a practice of deregulation as a response to the challenges of post-industrialism and what are the consequences of these reforms on social cohesion and on women's labor market perspectives?

In the newest wave of socio-economic literature it has been acknowledged that the liberal type US-American regulatory environment has induced labor practices over the last decades that are rather unfavorable in terms of women's work life opportunities. Jacobs and Gerson (2004) argue that the

regulatory environment in the United States triggered a growing bifurcation of work into extreme jobs and underemployment. Regulatory constraints incentivize employers to divide the labor force into full time workers with extremely long working hours, and project-based contract agents with short working hours and no benefits. Employers can lower their total compensation costs by pressuring their full-time employees to put in unpaid overwork. They can do so because professionals are rarely unionized and the US legislation allows for the existence of “exempt” positions in which employees are exempt from working hour regulation. As women are still the primary caretakers at home, and these full time jobs require long and odd working hours (“total commitment”), they have remained to be dominated by male employees.

In her book, *The unfinished revolution*, Gerson (2009) argues that a new generation of US-American women and men would like to redefine work-family balance in a more egalitarian spirit, yet they are not sure how to implement it in a society that lacks family friendly labor institutions. The fact that regulation, or the lack thereof, allows for the existence and proliferation of extreme jobs and, in general, rigid working environments with overtime commitment expectations is an important obstacle in the continuation of women’s unfinished revolution. Gerson (2009) proposes that only through cultural and institutional change that values equality and balance could these values be transformed into real options. Her suggestions for institutional practices include: creating workplaces that separate essential benefits from full-time employment; outlawing labor regulation that discriminates against workers with family responsibility; and creating labor regulation that supports the creation of part-time jobs for men and women alike. Following a very similar line of reasoning, Esping-Andersen (2009) goes one step further in arguing that the “incomplete nature of the female revolution” in most of

## Extreme working hours

the weaker welfare states might be the harbinger of new inequalities and possibly even of greater social polarization. And, as these disequilibria cannot be managed by families and the markets themselves, it is the responsibility of the welfare state to create institutions that incentivize the enhancement of more gender equality at work and at home.

Besides measuring the power of the welfare state in counteracting market forces, the second major motivation of the causal analysis of this paper is to reveal the exact effects of changing market structures on the evolution of extreme working hour patterns. Do countries that are more integrated in the global economy exhibit higher incidence of extreme hours than less open economies? If so, by how much more? What is the role of different market structures in extreme working hour outcomes? Are service-economies more prone to have an unbalanced working hour profile than less service-oriented economies?

Theories of global value chains suggest that as the structure of advanced capitalist economies experiences a gradual transformation from industrial production to service-dominated activities and the organization of a large proportion of production has been shifted to a global level, the quality of work is determined by new mechanisms. The continuous restructuring of global value chains calls for an increased flexibility in terms of contract types, assignments, and working hours. In order to adjust to increasing fluctuations in demand and to optimize their cost structure, employers look for ways to synchronize working time to market demands (Castel 1995). Theory suggests that, as a result, fixed term contracts and very long working hours are on the rise while, at the same time, workers daily and weekly schedules are getting more de-standardized (Chiesi 1989).

If we examine the types of pressures for long working hours on service providers who operate at different levels of the global value chain, we find great variability in terms of the drivers. Workers at the central, or core group, often face heavier workload following phases of restructurings. As the ‘survivors’ of the restructuring process, they often have to cope with more tasks and responsibilities, and are tacitly forced to work overtime until the tasks are done (Krings et al. 2009). Towards the periphery nodes of the value chain (sub-contractors, freelance workers, etc.), service providers rely on flexible working hours and overtime for different reasons. As they are responsible to overcome the shortcomings and delays of the core, they often have to perform under short notice, “with an immediate impact on the quality and conditions of work” (Krings et al. 2009).

With rapid de-industrialization and the revolution of information and communication technologies, the employment structure of advanced capitalist countries transformed in a way that high-end service sectors expanded in an unprecedented way (Wren 2013). Today approximately three quarters of employment in OECD countries is in services. Sectoral level analysis suggests that extreme working hours have become common in high-end service sectors, in which high-skilled employees provide internationally traded services, and low skilled service jobs, in which workers provide non-traded private services, such as child care and food services. High-skilled and low-skilled workers in the service sector are exposed to extreme working hour expectations for different structural reasons.

While in the 1960s, highly skilled employment was concentrated in untraded professions, such as local health care, public sector, and local law, the transition of advanced market structures to an internationally traded knowledge-based service economy has changed the extent to which highly

## Extreme working hours

skilled employees are exposed to international markets (Wren 2013). The high incidence of extreme working hours in high-end services is a consequence of these sectors' exposure to international competition (Rodrik 1997). As Rodrik points out, trade opening and globalized competition creates an inequality in bargaining power between employers and employees that sixty years of labor legislation in the United States has tried to prevent. Because the production is organized in a way that it can easily be shifted to other locations while employees are less mobile, employees will accept compromises on employment practices, such as working hour stipulations and actual working time practices, health and safety standards, labor/management negotiation practices, etc. Extreme working hours have become prevalent at least partly because, in exchange for the maintenance of relatively high income levels, highly skilled employees had to accept compromises in terms of working hour norms. Low skilled workers, to the contrary, are less exposed to international competition today, as they moved from manufacturing to internationally non-traded private services. However, due to increasing income inequalities, low-skilled workers' shift to sheltered professions could not manifest in a lower incidence of extreme working hours either (Wren 2013).

The empirical part of this paper is a first attempt to measure both the effect of economic globalization on the evolution of extreme working hour patterns as well as the effectiveness of the welfare state in counterbalancing these effects. While the root causes of longer work weeks have been theorized by scholars of other disciplines as well (Landers et al. 1996, Frank and Cook 1995, Peng 2003, Gallino 2002), a complete holistic analysis is beyond the scope of this paper.

### 3. Data

Data on the ratio of extreme working hours among various demographic groups of 18 advanced capitalist countries has been sourced from the author's standardized meta-database of extreme working hours. The meta-database will be named and made available in a published version. It had been compiled directly from two existing micro data collections: the Luxembourg Income Study Database (LIS) and the Multinational Time Use Study (MTUS). Both micro data collections contain a large number of harmonized country-level surveys from various years, starting as early as from the 1970s. In the meta-database of extreme working hours, and throughout the empirical analysis of this article, extreme working hours (or "extreme ratios", "ratio of extremes", "ratio of extreme jobs", or "ratio of extreme workers", all of them used as synonyms) are conceptualized and operationalized as weekly working hours of 50 or more. Data from the following countries are included in the meta-database: Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Norway, Spain, Sweden, Switzerland, the United Kingdom, and the United States.

The country-year ratios of extreme working hours were calculated for each nationally representative survey from the harmonized LIS and MTUS databases in which individual respondents' age, gender, 3-category highest educational level indicator, employment status, and weekly working hours were reported. Surveys that do not contain one or more of the above listed variables were left out from the standardized meta-database.

For a detailed analysis of the original data and the harmonization process leading to the compilation of the meta-database of extreme working hours,

please see Appendix A. For the exact and complete list of the original surveys harmonized by the MTUS and LIS centers and then used as a source in the standardization process, along with the name of each original survey data provider institution, please see Appendix B.

The explanatory variables used in the analysis aiming at identifying the determinants of extreme working hour patterns have been sourced from various publicly available sources: World Bank's World Development Indicators, Armingeon Comparative Political Dataset, OECD labor statistics, and Fraser Institute's Economic Freedom of the World Indicators dataset. Appendix C gives detailed information on the sources and definition of the explanatory and control variables used in the empirical analysis.

## 4. Specific hypotheses

The theories relating to the determinants of extreme working hours in advanced capitalist societies, as explicated in length in the literature review section, are empirically tested using a list of specific hypotheses, summarized in Table 1.

**Table 1. Summary of predicted effects of the main explanatory variables on the share of extreme workers**

Variable	Predicted effect	Rationale	Predicted coefficient
Labor market regulation	-	Looser working hour regulation allows employees to lower their total compensation costs by pressuring their full-time employees to put in unpaid overwork. Therefore less rigid regulatory constraints are expected to lead to higher levels in the prevalence of extreme hours. As lower scores indicate stronger labor regulation, the predicted coefficient is positive. (Jacobs and Gerson 2004; Häusermann and Palier 2008)	+



Part time employment	-	This variable is a proxy for the extent to which the welfare state has been successfully adapted to the needs of post-industrial labor markets in an employment and family friendly way. Strong welfare states have created institutions that encourage gender equality in terms of working hours both at paid work and at home therefore countries with higher ratios of part-time employment are expected to exhibit lower ratios of extreme workers. (Esping-Andersen 2009; Gerson 2009)	-
Controls of the movement of capital and people	-	Countries where a higher ratio of the production is organized at the global level are expected to exhibit higher ratios of extreme workers. This is because the continuous restructuring of global value chains calls for an increased flexibility in terms of contract types, assignments, and working hours. As lower scores indicate stronger regulation of controls, the predicted coefficient is positive. (Castel, 1995; Krings et al. 2009)	+
Openness of the economy	+	Trade opening and globalized competition creates an inequality in bargaining power between employers and employees: production can easily be shifted to other locations while employees are less mobile. As a result, the more open an economy is, the more likely it is that its workers will accept compromises on employment practices, such as the working hour norms. (Rodrik 1997)	+
Services (% of GDP)	+	Extreme working hours have become common in service-oriented economies, in which high-skilled employees provide internationally traded services and low skilled workers provide non-traded private services, such as child care and services food. The high incidence of extreme working hours among high-skilled workers in high-end services is a consequence of these sectors' exposure to international competition. The high incidence of extreme working hours among low-skilled workers in sheltered professions is a consequence of increasing income inequalities. (Wren, 2013)	+

## 5. Empirical results

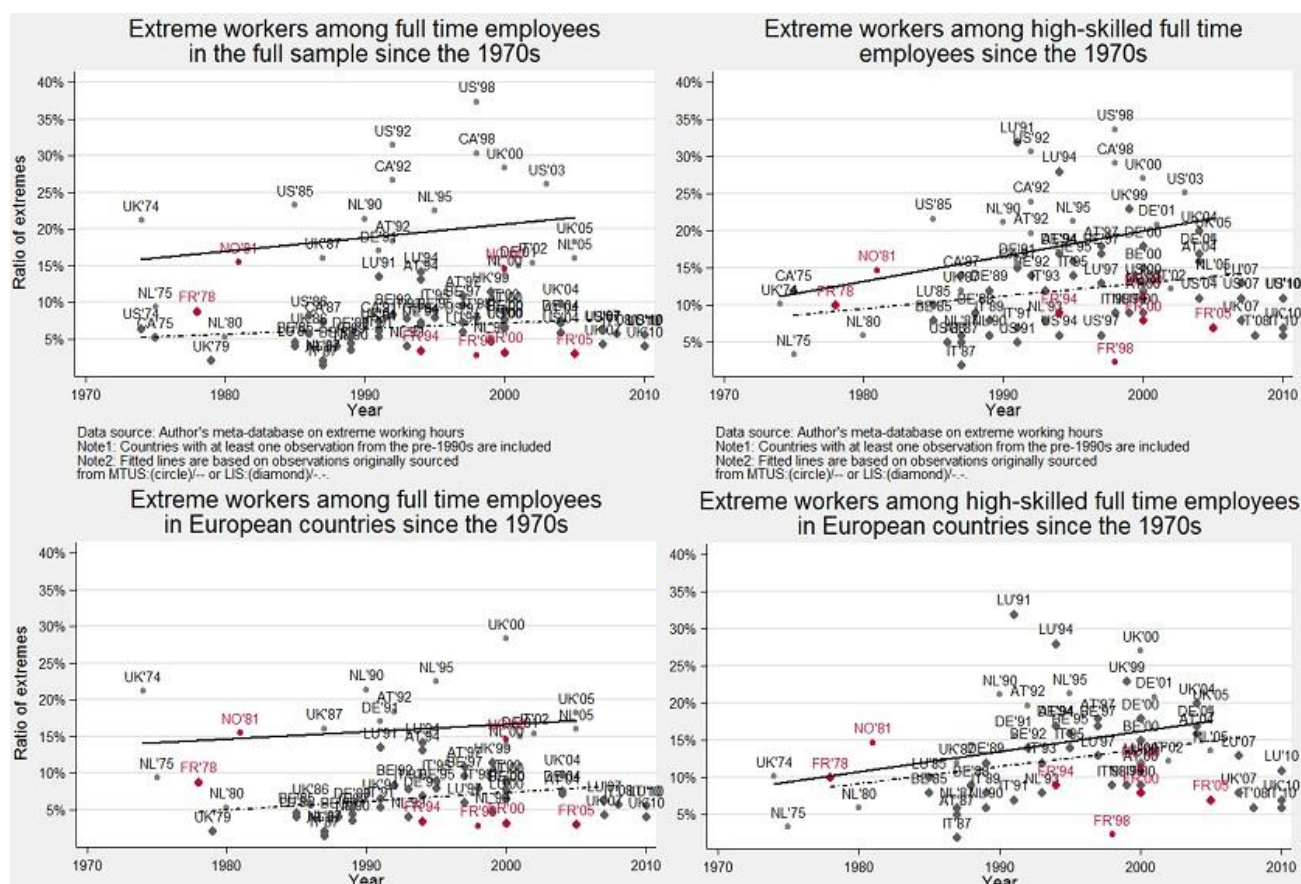
### 5.1 Main trends: Patterns of extreme working hours

Figure 1 illustrates the main longitudinal trends in extreme working hours in Western European and North American countries. The upper left panel

## Extreme working hours

illustrates a general increasing trend in the ratio of extreme workers among all full time workers. The upper right panel illustrates an even more pronounced increasing trend among high-skilled full time workers. In order to show that the trends are not merely driven by the observations for the United States and Canada, the lower panels show results for European countries only. All four scatterplots depict country-year observations on extreme ratios between 1970 and 2010. In the meta-database, and thus throughout the entire empirical analysis of this paper, extreme working hours are conceptualized and operationalized as weekly working hours of 50 or more. All countries with at least one observation from the pre-1990s are included. These are Austria, Belgium, Canada, France, Germany, Italy, Luxembourg, Netherlands, Norway, United Kingdom, and United States. As no pre-1990 observations were available for Denmark, Finland, Greece, Ireland, Spain, Sweden, and Switzerland, these are not included in this figure. The fitted lines are based on observations originally sourced either from the MTUS or from the LIS databases. The separation of the two fitted lines is necessary because MTUS surveys report systematically higher extreme ratios than LIS surveys.

The great variation around the increasing trends suggests that work patterns are not inherent in post-industrial development. While the Anglo-Saxon countries along with many continental European countries exhibit much higher ratios of extreme workers after the beginning of the 1990s than in the previous two decades, the French and Norwegian full time workers seem to be enjoying at least as balanced working hour profiles as before: extreme ratios among French and Norwegian full time workers seem to have been declining over the course of the past four decades.

**Figure 1**

These first findings suggest that the working hour profile of many European full time workers, particularly those with high-skills, seem to have been converging towards the US-American pattern: an increasing ratio of high-skilled European workers are overworked since the beginning of the 1990s. This finding contradicts the earlier proposition of Jacobs and Gerson (1998) who argue that international comparison suggests that the US-American pattern of working time bifurcation has not been replicated in most other affluent societies. They suggest that Europeans were able to maintain a high and growing standard of living with a very different work profile than is evident in the United States.

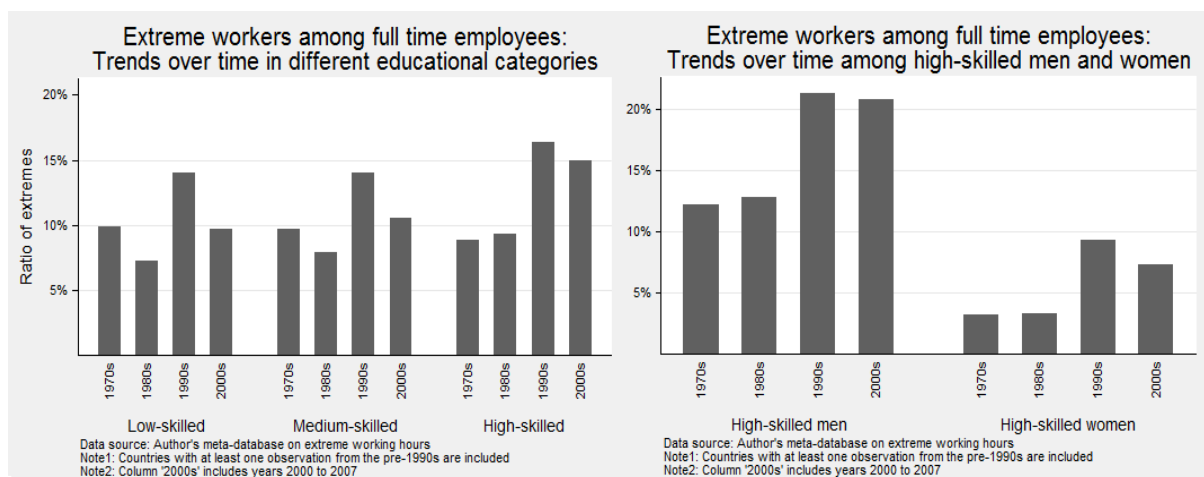
On the other hand, some countries (France and Norway in this sample) seem to have been able to maintain a balanced work profile during the years and

## Extreme working hours

decades of transition from industrial production to service-oriented post-industrialism.

Figure 2 illustrates trends of extreme hours over time in a number of socio-economic subpopulations of the Western European and North-American societies since the 1970s. The bar charts present decade averages of country-year level observations of extreme ratios of all the countries for which at least one observation from the pre-1990s was available.

**Figure 2**



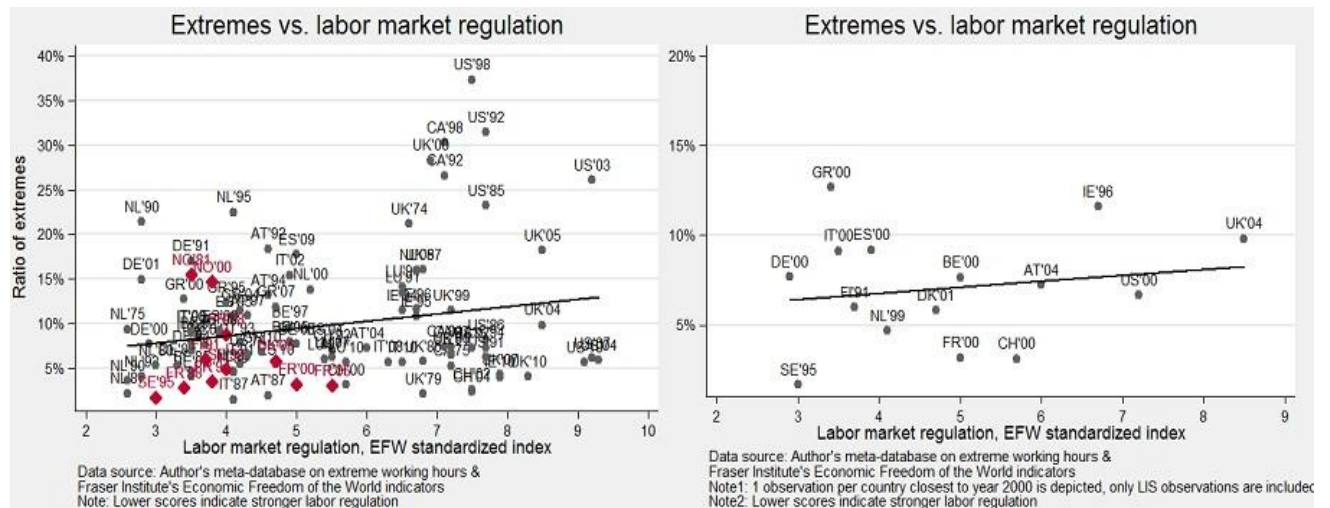
The left panel illustrates different trends among full time workers in three educational categories: low-skilled workers with less than secondary education completed, medium-skilled workers with completed secondary education, and high-skilled workers with at least one year of completed tertiary education. While the trend of extreme ratios is increasing in all three educational categories, the most radical increase occurred in the high-skilled category. While in the 1970s, it was the high-skilled workers who enjoyed the least unbalanced work schedule, the ratio of extremes in the high-skilled category radically increased from the 1980s to the 1990s and remained the highest in the 2000s.

The right panel points to an important aspect of the puzzle surrounding the transformation of work in post-industrialism. While our data suggest a sharp increase in the ratio of extreme work profiles among high-skilled men, long work weeks have remained relatively uncommon among high-skilled women. More particularly, the figure illustrates that, in our sample, while more than one in five high-skilled men worked 50 hours per week or more in the first decade of the 21st century, the comparable figure was only one in twelve for women. Equally striking is the fact that this two-to-threefold gender difference was about the same in the 1970s. The fact that the gender difference has not diminished over the course of the past decades supplements existing evidence supporting theories on the incomplete nature of the female revolution (Esping-Andersen 2009; Gerson 2009). It seems that these empirical results support the theory that most advanced capitalist societies in Western Europe and North America have not been able to install policies and practices that would have been able to redefine the notion of work-family balance in a more egalitarian spirit.

Figure 3 provides a first hint about the relationship between the strength of labor regulation and the prevalence of extreme working hours in advanced capitalist countries. The scatterplots depict country-year level observations on extreme ratios among full time workers, plotted against the strength of labor regulation in the given country in the given year, sourced from Fraser's Institute's Economic Freedom of the World Indicators (EFW) dataset. As lower scores of the EFW standardized index indicate the existence of stronger labor regulation in a given country in a given year, the increasing slope of the fitted lines implies a clear negative relationship between the ratio of extremes and the strength of labor regulation. Countries with stronger labor regulation have exhibited systematically lower levels of extreme working hour ratios

than countries with flexible labor regimes over the course of the past four decades.

**Figure 3**



Furthermore, we can read two specific stylized trends from the scatterplot. First, countries with more flexible labor regimes cluster in the top right corner of the graph while strong European welfare states with strong employment protection regimes cluster in the bottom left corner. Moreover, this clustering has remained relatively stable since the 1970s, implying the existence and stability of different labor regimes. Second, with the exception of the Scandinavian welfare states and France, all other countries moved towards the up-right corner over time. This implies the development of two diverging trajectories of post-industrial labor regulation strategies: one with strong and stable labor regulation along with a balanced working hour profile and another one with gradual deregulation along with an increasing ratio of long work weeks.

The left panel depicts all observations from all countries that are included in the author's meta-database. The right panel depicts one observation per



country, from the year closest to 2000, for all the countries for which a close-to-2000 LIS observation was available. This way, we avoid potential biases caused by differences between the original data sources (LIS and MTUS) and by the unbalanced nature of the panel data set. All stylized trends remain the same using this restricted sample.

## 5.2 Regression analysis: The root causes of diverging patterns

Table 2 reports the results of a series of pooled cross-section OLS estimations with which the explanatory power of the specific hypotheses listed in Table 1 in Section 4 were tested. The nine columns show the regression outputs for three different estimations: the dependent variable in columns (1)-(3) is *Extreme workers*: the overall ratio of extreme workers among full time employees; in column (4)-(6) it is the *High-skilled extreme workers*: the ratio of extreme workers among high-skilled full time workers; whereas in (7)-(9) it is the *High-skilled male extreme workers*: the ratio of extreme workers in the high-skilled male full time workers in a given country in a given year. For all three dependent variables, the main aim of the analysis was to disentangle causal relationships between characteristics of the welfare state, those of the market structure, and the outcome in extreme working hour ratios. The rationale for the separate analysis of the three dependent variables comes from theory. Political economy theories of the global value chains (Krings et al. 2009), the service sector (Wren 2013), economic globalization (Rodrik 1997), and welfare state adaptability (Esping-Andersen 2009; Gerson 2009) suggest that the determinants of extreme working hour patterns in advanced capitalist countries might differ for different socio-economic subpopulations, such as groups with different educational attainment and gender profiles.

## Extreme working hours

For each of the three dependent variables, three specifications are reported in Table 2. The first ones, Columns (1), (4), and (7), include all main explanatory variables listed in Table 1, and three control variables: *Real GDP growth*, *Year*, and a *Dummy for the data source of the dependent variable*. The second specifications, Columns (2), (5), and (8), include the significant explanatory variables from the first specifications and a list of *decade dummies*. In the third specifications, Columns (3), (6), and (9), insignificant variables are dropped.

The most remarkable result is that the two policy variables (*Labor market regulation* and *Part time employment*, the latter as a proxy for the extent to which the welfare state has been successfully adapted to the needs of post-industrial labor markets in an employment and family friendly way) appear as robust and significant determinants of extreme working hour outcomes for all three dependent variables in all specifications with signs in the expected direction. Moreover, the magnitude of the effect is stable even if all the theoretically important control variables are introduced. This finding provides empirical evidence in support of the newest wave of welfare state theory arguing that strong welfare states are able to hamper the development of a further polarization of their labor force while transforming successfully to service economies. Thus economic structural effects do not seem to be deterministic: strong welfare states have been able to counteract structural effects by introducing more egalitarian labor and welfare institutions.

The overall effect of the three market structure variables, measuring different aspects of national economic structures (*Controls of the movement of capital and people*, *Openness of the economy*, and *Services (% of GDP)*) is more diversified. The work profile of the high-skilled population seems to be strongly influenced by market structure characteristics whereas the overall ratio of



extremes (*Extreme workers*) is only partly responsive to these variables. This implies that, all other things equal, changing market structures indeed have significant increasing effect on the ratio of extremes, particularly among high-skilled workers. I argue that it is important that these effects are identified and quantified as it proves that there is a real need for the welfare states to step in order to counteract these effects.

Among the three market structure variables, the measure of economic globalization (*Controls of the movement of capital and people*), a composite index of foreign ownership penetration, investment restrictions, and capital controls, has the most stable and robust impact on extreme working hour outcomes. It is the only market structure variable that remains significant for the ratio of extremes in the overall population (*Extreme workers*). However, for high-skilled workers and high-skilled male workers, the significance and the magnitude of the estimated coefficient is even larger: it is approximately twice as large. This finding implies that the level of economic globalization - the extent to which the production in a national economy is organized as part of a global value chain – has more pronounced effects on the working hours of high-skilled workers than on those of less skilled workers. This finding is in line with theory: the continuous restructuring of global value chains has a significant coercive effect towards more, and more flexible, working hours in the entire working population (Castel 1995). The mechanisms pushing for long work weeks, however, are clearly different for workers who operate at different levels of the global value chain (Krings et al. 2009). Besides corroborating existing theory, my findings add to the literature by measuring the magnitude of the effect on different subpopulations with different educational attainments.

## Extreme working hours

The openness of the economy, measured as the sum of imports and exports compared to the size of the GDP, has a significant effect on the ratio of extremes among high-skilled workers but it has no significant effect on the ratio of extremes in the overall population in advanced capitalist societies. This finding confirms political economy theories arguing that in the new knowledge-based economies, where the majority of high-skilled workers are employed in internationally traded services, trade opening creates an inequality in bargaining power between employers and employees. Production can easily be shifted to other locations while employees are less mobile. As a result, in exchange for the maintenance of a relatively high income level, employees accept compromises on employment practices, such as working hour norms (Rodrik 1997). The finding that lower skilled workers are not significantly influenced by the openness of the economy proves that extreme working hours among lower skilled workers, who transitioned to non-traded services, such as child care and food services, are driven by other mechanisms, such as increasing income inequality.

The explanatory power of the third market structure variable (*Services (% of GDP)*) appears to be insignificant for all three dependent variables. A possible reason is that there might be strong correlation between this variable and the *Openness of the economy* variable, and, as a result, the effect is taken up by the openness measure. To avoid potential misspecification resulting from a possible multi-collinearity problem, the *Services (% of GDP)* variable was left out from the second and third model specifications for all dependent variables: from columns (2), (3), (5), (6), (8), and (9).

**Table 2: Determinants of the share of extreme workers in 18 developed capitalist countries, OLS regressions with Country Clustered Std. Errors, Unbalanced Panel Data 1970 to 2010**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Dependent variable	Extreme workers	Extreme workers	Extreme workers	High-skilled extreme workers	High-skilled extreme workers	High-skilled extreme workers	High-skilled male extreme workers	High-skilled male extreme workers	High-skilled male extreme workers
Labor market regulation	1.416*** (0.421)	0.952*** (0.308)	0.877** (0.371)	1.444** (0.535)	1.275** (0.458)	1.093*** (0.364)	1.705** (0.630)	1.554** (0.541)	1.378*** (0.426)
Part time employment (% of total employment)	-0.198** (0.085)	-0.201** (0.078)	-0.198** (0.071)	-0.210** (0.073)	-0.214*** (0.070)	-0.241*** (0.077)	-0.297*** (0.094)	-0.308*** (0.093)	-0.332*** (0.097)
Controls of the movement of capital and people	0.651* (0.333)	0.473 (0.330)	0.580* (0.306)	1.169** (0.523)	0.886* (0.481)	1.200** (0.502)	1.423** (0.582)	1.109* (0.551)	1.447** (0.506)
Openness of the economy, measured as total trade	0.026* (0.014)	0.013 (0.013)		0.037*** (0.011)	0.035*** (0.011)	0.032*** (0.011)	0.038*** (0.012)	0.039** (0.014)	0.035** (0.013)
Services (% of GDP)	-0.216 (0.158)			-0.116 (0.128)			-0.153 (0.160)		
Real GDP growth	-0.400 (0.422)			0.045 (0.320)			0.151 (0.364)		
Year	-0.037 (0.070)			-0.071 (0.133)			-0.006 (0.149)		
Dummy for the decade of the 1990s		3.139*** (0.943)			4.833*** (1.590)			5.549*** (1.826)	
Dummy for the years 2000 to 2007		0.441 (1.663)			2.074 (2.331)			3.283 (2.689)	
Dummy for the crisis years 2008-2010		1.814 (1.894)			0.304 (1.911)			0.909 (2.363)	
Dummy for datasource of dependent variable (MTUS or LIS)	15.467*** (2.773)	15.433*** (2.855)	14.993*** (2.582)	9.544*** (2.860)	8.928*** (2.963)	9.039*** (2.900)	13.042*** (3.884)	12.282*** (3.874)	12.461*** (3.750)
Constant	69.973 (135.713)	-17.267*** (4.595)	-14.425*** (4.041)	134.606 (263.226)	-14.032*** (3.730)	-12.283*** (3.634)	4.158 (295.058)	-16.675*** (4.636)	-14.465*** (4.427)
Number of observations	85	90	90	83	87	87	83	87	87
R <sup>2</sup>	.661	.639	.606	.450	.455	.398	.470	.469	.429

Notes: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. Country clustered robust standard errors in parentheses. Country clustered robust standard errors were used to correct for heteroskedasticity and within-cluster correlation in the errors. Heteroskedasticity was tested by Breusch-Pagan test. Dummy for the decade of the 1980s is omitted because of collinearity. OLS: Ordinary Least Squares. In the variables 'Labor market regulation' and 'Controls of the movement of capital and people', lower scores indicate stronger regulation and controls, respectively.

## Extreme working hours

As control variables, *Real GDP growth* and *Year* were introduced in the first specification for all dependent variables. *Real GDP growth*, as a measure of business cycles, was introduced to make sure that fluctuations in the ratio of extreme working hours are not only the result of changes in the economic cycles. *Year* was plugged in to control for potential co-integration problems. As none of the two control variables proved to have a significant effect, they were left out from the second and third model specifications. In the second specifications, in columns (2), (5), and (8), decade dummies were introduced to measure large-scale overall trends in time. The estimation results show that in the 1990s, beyond the effect of changing regulation and market structures, the overall ratio of extreme workers was significantly higher in all educational subcategories than in the 1970s and 1980s but the increase was higher among high-skilled workers (4.8 percentage point higher), and even higher among high-skilled male workers (5.5 percentage point higher). In the overall population, a 3.1 percentage point increase was detected. The positive coefficients for the dummies of the first decade of the 21<sup>st</sup> century indicate that the ratio of extremes was higher in the 2000s than in the 1970s and 1980s (beyond the effect of changing regulation and market structures) but this effect is estimated to be smaller and less precise than in the 1990s. The last control variable used is a dummy for the data source of the dependent variable. The estimation results prove that MTUS observations are systematically higher than LIS observations. For all regression estimations, country clustered standard errors were used to correct for heteroskedasticity and within-cluster correlation in the errors.

### 5.3 Robustness check: Alternative model specifications

The main results of the paper shown in Subsection 5.2 were obtained by pooled cross-section regression analysis, which uses both the longitudinal and the cross-section aspect of the data for identification. There are two reasons why that method is most appropriate for the present analysis. First, panel methods with a stronger focus on the longitudinal aspect work best when there are many observations for the same unit. This is not the case in the meta-database of extreme workers that this paper analyses: the unbalanced panel data set consists of 104 observations from 18 countries (and 27 country-data source combinations). Second, the interest of this study in comparing various welfare systems implies that the cross-country aspect should be in the focus of this study, rather than be blended out.

With these caveats in mind, it may be interesting to see whether some of the main results of the paper can be confirmed by panel methodologies. Therefore, as a robustness check, this Subsection presents results obtained by such methods.

Table 3 shows results from a set of parsimonious panel specifications that include only the central variables of the analysis. The panel units are country-data source combinations. The choice between the fixed-effects and the random-effects specifications is decided by a Hausman test reported in the table. In the reported results, insignificant variables are dropped.

## Extreme working hours

The first column of Table 3 shows that the overall ratio of extreme workers is significantly affected by *Part time employment*, a proxy for the extent to which the welfare state has been adapted to the needs of post-industrial labor markets in an employment and family friendly way, even if country fixed effects are introduced. The implication is that the more egalitarian labor institutions are, the lower is the ratio of extreme workers. Market structure variables are left out of this specification because they were insignificant. As no control variables enter this estimation in a robust manner, the coefficient can only be understood as an indication of negative within-country correlation.

Table 3: Determinants of the share of extreme workers in 18 developed capitalist countries, Panel estimations, Unbalanced Panel Data 1970 to 2010			
	(1)	(2)	(3)
	Fixed effects GLS	Random effects GLS	Random effects GLS
Dependent variable	Extreme workers	High-skilled extreme workers	High-skilled male extreme workers
Labor market regulation		1.198** (0.576)	1.400** (0.642)
Part time employment (% of total employment)	-0.222* (0.128)	-0.264* (0.150)	
Controls of the movement of capital and people		1.198** (0.472)	1.014*** (0.389)
Constant	13.779*** (2.070)	2.036 (5.167)	2.955 (4.692)
Hausman specification test	$\chi^2_{(3)} = 1.82$ $p\text{-value} = .001$	$\chi^2_{(3)} = 7.76$ $p\text{-value} = .051$	$\chi^2_{(3)} = 1.91$ $p\text{-value} = .384$
$R^2$	.045	.113	.121
Number of observations	92	87	97
Number of countries	18	18	18
Number of groups (country-datasource units)	27	27	27

Notes: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. Standard errors in parentheses. The Hausman specification test was used to compare the fixed effects model to the random effects model. Hausman Ho: Random effects is consistent, the error term is not correlated with the regressors. GLS: Generalized Least Squares. In the variables 'Labor market regulation' and 'Controls of the movement of capital and people', lower scores indicate stronger regulation and controls, respectively.

The ratios of high-skilled extremes and of high-skilled male extremes are significantly affected by both policy variables and the first market structure variable (*Controls of the movement of capital and people*). These results are consistent with the main estimation results as well as with the expectations

coming from political economy theories of globalization and of the welfare state.

## 6. Conclusion

The article provides strong empirical evidence for the notion that patterns of extreme working hours are neither inevitable nor inherent in post-industrial development. International comparison suggests that strong welfare states have been able to maintain a high level of economic efficiency and high standards of living by a less polarized working hour profile than it is evident in the United States, Canada, and in many Western European countries. During the decades of transition from industrial production to service-oriented post-industrialism, France and the Scandinavian countries maintained remarkably low ratios of extreme jobs while the ratio gradually increased in Austria, Belgium, Canada, Germany, Italy, Ireland, Luxembourg, The Netherlands, Norway, the United Kingdom, and the United States. The longitudinal analysis of the paper implies the existence and stability of two diverging trajectories of post-industrial labor regulation strategies: one with strong and stable labor regulation along with a balanced working hour profile and another one with gradual deregulation along with an increasing ratio of extreme jobs. These findings contradict the proposition of Jacobs and Gerson (1998) who argue that Western European countries cluster into one homogenous group in terms of extreme working hour outcomes as opposed to the United States.

The article then introduces a more detailed analysis into the socio-economic background of extreme workers, showing that the most radical increase in the ratio of extreme working hours occurred among high-skilled men in the

eighteen advanced capitalist countries observed. The fact that a two-to-threefold gender difference between the ratio of extreme workers among high-skilled men and high-skilled women has not diminished over the course of the past decades supports theories on the incomplete nature of the female revolution (Esping-Andersen 2009; Gerson 2009). It indicates that most Western European countries have not been able to redefine the notion of work-family balance in an egalitarian spirit.

The article uses a series of pooled cross-section OLS estimations to quantify the effects of changing market structures and welfare state reforms on the incidence of extreme jobs in advanced capitalist societies. Changing market structures, such as economic globalization and economic openness seem to have significant increasing effects on the ratio of extremes, particularly among high-skilled workers. The article shows that the level of economic globalization – conceptualized as the extent to which the production in a national economy is organized as part of a global value chain and operationalized as a composite index of foreign ownership penetration, investment restrictions, and capital controls – has twice the effect on the ratio of extreme working hours among high-skilled workers than among the whole working population. The openness of the economy, measured as the sum of imports and exports compared to the size of the GDP, has a significant positive effect on the ratio of extremes among high-skilled workers but no significant effect on the overall ratio of extreme workers. These empirical findings are in line with theories of global value chains (Castel 1995), of unequal bargaining positions in the global economy (Rodrik 1997), and of the diversified effects of the service transition (Wren 2013). However, these effects do not seem to be deterministic: strong welfare states have been able to



counteract these structural effects by introducing more egalitarian labor and welfare institutions.

Finally, as the view that labor market flexibilization has a positive impact on productivity growth, has gained currency among many scholars (e.g. Beck 2000; Blanchard and Giavazzi 2003), a brief final remark is in order. The relationship between productivity and extreme working hours, the latter as an outcome of weak labor regulation, is ambiguous, at the minimum. A higher prevalence of extreme jobs in a given country does not necessarily lead to higher productivity levels. On the contrary, my empirical findings (summarized in Appendix D), along with a large body of literature on the negative impacts of labor market deregulation (Vergeer and Kleinknecht 2011; Storm and Naastepad 2009; Svensson 2011), show a negative relationship between the two variables. Countries with a more balanced working hour profile seem to be able to reach higher productivity levels.

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## Appendix A: Methodology of data compilation of the author's meta-database of extreme working hours

### Data sources

The standardized meta-database of extreme working hours has been compiled directly from two large micro data collections: the Luxembourg Income Study Database (LIS) and the Multinational Time Use Study (MTUS). The LIS is the largest available income database of harmonized microdata which has lately become a widely used data source in income inequality research (e.g. Andersen 2012; Atkinson, Piketty, and Saez 2012; Forster and Vleminckx 2004; Mahler and Jesuit 2006; Pontusson and Rueda 2008). Along with a range of variables on market income, public transfers and taxes, household- and personal-level characteristics, most of the LIS data sets contain labor market variables, such as employment status and weekly working hours. The LIS was first conducted in 1968 in three countries. In 2010, the database included data from forty-five countries on four continents. From the 1980s until 2000, LIS surveys were organized into waves corresponding to five year intervals. Since 2000, the survey was conducted more frequently: the sixth wave in 2004, the seventh in 2007, and the eighth in 2010.

The MTUS is the largest harmonized collection of time use diaries, from more than 23 countries, covering more than four decades from the early 1960s to present. The original MTUS allowed the comparison of British time use data with the 1965 Szalai Multinational Time Budget Study and data from Canada and Denmark. Since then the MTUS has grown to offer harmonized episode and context information and encompasses over sixty datasets from 23 countries, including recent data from the HETUS (Harmonized European

Time Use Survey), ATUS (American Time Use Survey), and other national-level time use projects.

The LIS center collects and harmonizes an entire range of different microdata sets that were originally provided by research centers and statistical offices of the participating countries (e.g. household panel surveys, socio-economic panel surveys, income distribution surveys, income and wealth surveys, waves of EU-SILC (EU - Survey on Income and Living Conditions), current population surveys, family expenditure surveys, family budget surveys, etc.). The MTUS center collects and harmonizes nationally representative time use diaries that were originally conducted by the participant country's national statistical offices. For an exact and complete list of the original surveys that were harmonized by the MTUS and LIS centers and then used as a source in the standardization process of the meta-database, along with the name of each original survey data provider institution, please see Appendix B.

As a result of the harmonization processes implemented by the MTUS and LIS teams, all variables in the MTUS and LIS databases are standardized both in terms of conceptual content and in terms of coding. Standardization in terms of conceptual content implies that the concept and definition of variables are comparable across all datasets. Standardization in terms of coding implies that continuous standardized variables report information expressed in the same unit across different datasets (e.g. hours variables report number of hours worked per week, age variables report number of years), and categorical standardized variables report information expressed with the same value codes and labels.

Harmonized microdata from the LIS and MTUS centers are available to registered users world-wide. While the MTUS microdata can be downloaded directly from the center's homepage, LIS does not provide direct access to its

## Extreme working hours

microdata collection. Instead, it operates a remote-execution data access system (LISSY) through which users can submit programs using common statistical software packages. The execution of the programs is done by the LIS team and outputs are returned to users through the interface as well as per email.

MTUS and LIS data are not suitable for individual-level panel analysis but they are suitable for repeated cross-section analysis as respondents cannot be linked over time and different country-year surveys come from different years.

## The standardization process

To produce the meta-database of extreme working hours, the share of employees with extreme working hours has been computed from 104 nationally representative surveys for 24 socio-economic subgroups in a standardized way. The standardization process resulted in a meta-database that contains the following list of standardized macro-level indicators (with 104 cases each) on the prevalence of extreme jobs in advanced capitalist countries (extreme working hours are operationalized as weekly working hours of 50 or more):

*Ratio of employees with extreme working hours among*

- i. all employed persons;*
- ii. all male employees;*
- iii. all female employees;*
- iv. all employees with low educational attainment;*
- v. all employees with medium educational attainment;*
- vi. all employees with high educational attainment;*
- vii. all male employees with low educational attainment;*

- viii. *all male employees with medium educational attainment;*
- ix. *all male employees with high educational attainment;*
- x. *all female employees with low educational attainment;*
- xi. *all female employees with medium educational attainment;*
- xii. *all female employees with high educational attainment;*
- xiii. *full time employees;*
- xiv. *full time male employees;*
- xv. *full time female employees;*
- xvi. *full time employees with low educational attainment;*
- xvii. *full time employees with medium educational attainment;*
- xviii. *full time employees with high educational attainment;*
- xix. *full time male employees with low educational attainment;*
- xx. *full time male employees with medium educational attainment;*
- xxi. *full time male employees with high educational attainment;*
- xxii. *full time female employees with low educational attainment;*
- xxiii. *full time female employees with medium educational attainment;*
- xxiv. *full time female employees with high educational attainment in the given country.*

For each survey in the harmonized LIS and MTUS database in which individual respondents' age, gender, 3-category highest educational level indicator, employment status, and weekly work hours were reported, country-level ratios of extreme working hours were calculated for each of the above listed socio-economic subcategories from the nationally representative population samples. Surveys from any of the two harmonized databases that do not contain one or more of the above listed variables were left out from the standardized meta-database.

## Extreme working hours

The following paragraph addresses potential measurement problems related to the above listed variables, as defined in the LIS and MTUS data set manuals.

The first variable where harmonization of micro-datasets could, in theory, invoke measurement problems is the variable on individuals' highest educational attainment. Luckily a 3-category highest educational attainment variable – *educ* in LIS surveys and *edcat* in MTUS surveys – was found in both harmonized databases with the exact same definition. Both are recoded variables whose harmonization was executed by the LIS and MTUS teams from the original country-specific variables on respondents' highest educational level. Although the original country specific formats vary to a large extent, the definition of the 3-category highest educational attainment variable is based on the Standard Classification of Education from UNESCO, ISCED97 in both harmonized databases. In both the LIS and MTUS data sets, the category 'low' stands for less than secondary education completed (no completed education or education completed at the ISCED levels 0, 1 or 2), category 'medium' stands for secondary education completed (completed ISCED levels 3 or 4), and category 'high' stands for at least one year of completed tertiary education (ISCED levels 5 or 6).

Employment status is another variable where potential measurement problems have to be addressed. LIS contains a simple 2-category variable – *emp* - which reports whether a respondent has self-declared herself to be employed or not employed. Though MTUS does not contain the same 2-category variable on employment status but it does contain a 4-category variable – *empstat* with self-declared 'full-time', 'part-time', 'employed and work hours unknown', and 'not employed' categories - which can easily be recoded into the exact same two categories that are defined in LIS' *emp*



variable. By recoding the first three categories of *empstat* into a new ‘employed’ category, the new 2-category variable in MTUS will fully overlap with the 2-category variable on employment status in LIS. This way, the same pool of respondents can be selected when one of the two categories of employment status are used in either of the surveys from the two harmonized databases.

Finally, an important note on the definition of our variable on weekly working hours. For the standardized meta-database of extreme hours, the *hours* variable was used from the LIS database and the *workhrs* variable from the MTUS simple database. Even though the two variables do not report answers to the exact same questions, the standardization of the two databases still gives the best meaningful large-scale comparative source on the patterns of employees’ working hours for the reasons that will be discussed in the following two paragraphs.

*Hours* in the LIS database records respondents’ regular hours worked at all jobs currently held including any overtime whereas *workhrs* in the MTUS database records respondents’ working hours at all jobs from last week including any overtime. Creating indicators of extreme working hours using either of the two variables (‘usual weekly working hours’ or ‘working hours from last week’) can be regarded as an extension to the harmonization of the working hour data from the individual surveys as done by the MTUS team. During the harmonization work executed on the original surveys, the MTUS team gave priority to the number of hours paid work during ‘last week’ even if data on the number of hours ‘usually worked’ was available (which was the case only in some surveys). However, if data on the number of paid working hours last week was not available, then *workhrs* was computed by using ‘usual hours’ of paid work. Furthermore, when neither question was

available, seven-day diaries or work schedules were used to measure hours worked during the diary week. Consequently, the harmonized *workhrs* variable in the MTUS data sets already uses a combination of answers to two different time-estimate questions and, in some cases, of an additional time-diary figure to create the harmonized *workhrs* variable on weekly working hours.<sup>1</sup>

It is worth noting that the extreme hour estimates in the meta-database that are sourced from the MTUS data sets are systematically higher or equal than the equivalent ones from the LIS data sets. The higher or equal estimates of extreme weekly working hours from the MTUS surveys are probably driven by two mechanisms. First, when respondents are asked about their working hours from last week, the distribution of the responses is likely to be more dispersed than when respondents are asked about their usual (average) working hours. As the extreme hour research concentrates on the higher end of this distribution, the estimates of our interest will be affected by this statistical curiosity. Second, a psychological mechanism might also play a role. It is possible that respondents with long working hours are likely to report their working hours more accurately when they are asked in detail about their recent schedule, which is the case in time use diaries. The reason for that might be that self-delusion into a more balanced work-life schedule than it is evident in reality has less space in this case. Now, regardless of the extent to which these mechanisms might or might not play a role in slightly

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<sup>1</sup> A group of scholars would probably challenge the measurement accuracy of the harmonization of reported weekly working hours data with time-diary figures, as it had been done by the MTUS team in the process of building MTUS' harmonized *workhrs* variable. Glorieux et al. (2011) and Gershuny and Robinson (1994) argue that survey answers to time-estimate questions on weekly working hours are systematically higher than working hour figures in time-diaries. Jacobs (1998), on the other hand, argues that the observed discrepancies between time-estimates and diary figures simply result from the „regression to the mean” phenomenon. The approach of the author of this paper is to accept the harmonization guidelines of the MTUS team but at the same time acknowledge the possibility that some MTUS surveys might report slightly lower working hour figures than the others, as these were sourced from time-diary figures. As the meta-database contains a large number of observations calculated from various types of surveys, a small number of these lower estimates will not distort long-term trends.

higher estimates of extreme working hours in the MTUS surveys, researchers using the meta-database should keep this delicate difference in outcomes in mind and should control for the survey source (LIS or MTUS). It is worth noting that this statistical curiosity of the meta-database does not distort longitudinal trends or cross-sectional within country trends in any way.

Finally, the share of extreme workers has been calculated in two versions. These differ as to the basic sample population to which the number of extreme workers was compared. Most of the literature (e.g. Jacobs and Gerson 1998, 2004; Krings, Nierling, Pedaci, and Piersanti 2005) analyzes ratios of long working hours within the pool of workers who report to have worked at least one hour in the previous month. This methodology is appropriate for cross-sectional comparison of cross-country and within country differences. However, it is less adequate for the analysis of longitudinal trends as structural changes in women's labor supply since the 1970s have radically broadened the pool of employed persons (the pool of workers with at least one working hour). Therefore, after calculating the first dozen indicators of extreme working hours over the pool of workers, aged between 23 and 62, with at least one hour of reported work in the previous month, the calculation of the indicators was repeated using a different pool of respondents: the pool of full time employees (operationalized as employed persons with a minimum of 30 working hours per week, in line with LIS and MTUS survey methodology standards, aged between 23 and 62). This supplement allows researchers to conduct longitudinal analyses on the prevalence of extreme jobs since the 1970s. Focusing on the ratios of long working hours among full time employees will allow researchers to move beyond cross-sectional comparative analysis into determining whether there are discernible time trends in the prevalence of extreme hours.

## Appendix B: Data sources of the author's meta-database of extreme working hours

Country	Survey	Harmonized data set	Original survey	Data provider of original survey
Austria	1987	LIS	Austrian Microcensus	Statistics Austria
Austria	1994	LIS	European Household Panel / AT ECHP	Interdisciplinary Center for Comparative Research in the Social Sciences (ICCR)
Austria	1997	LIS	European Household Panel / AT ECHP	Interdisciplinary Center for Comparative Research in the Social Sciences (ICCR)
Austria	2000	LIS	European Household Panel / AT ECHP	Interdisciplinary Center for Comparative Research in the Social Sciences (ICCR)
Austria	2004	LIS	Survey on Income and Living Conditions EU-SILC 2005 survey	Statistics Austria
Belgium	1985	LIS	Socio-Economic Panel (SEP)	University of Antwerp
Belgium	1988	LIS	Socio-Economic Panel (SEP)	University of Antwerp
Belgium	1992	LIS	Socio-Economic Panel (SEP)	University of Antwerp
Belgium	1995	LIS	Panel Study of Belgian Households (PSBH) / BE ECHP	University of Antwerp
Belgium	1997	LIS	Socio-Economic Panel (SEP)	University of Antwerp
Belgium	2000	LIS	Panel Study of Belgian Households (PSBH) / BE ECHP	University of Antwerp
Canada	1975	LIS	Survey of Consumer Finances (SCF)	Statistics Canada
Canada	1987	LIS	Survey of Consumer Finances (SCF)	Statistics Canada
Canada	1991	LIS	Survey of Consumer Finances (SCF)	Statistics Canada
Finnland	1991	LIS	Income Distribution Survey (IDS)	Statistics Finland
France	1978	LIS	Family Budget Survey (BdF)	National Institute of Statistics and Economic Studies (INSEE)
France	1994	LIS	Family Budget Survey (BdF)	National Institute of Statistics and Economic Studies (INSEE)
France	2000	LIS	Family Budget Survey (BdF)	National Institute of Statistics and Economic Studies (INSEE)
France	2005	LIS	Family Budget Survey (BdF)	National Institute of Statistics and Economic Studies (INSEE)
Germany	1989	LIS	German Social Economic Panel Study (GSOEP)	DIW Berlin
Germany	1994	LIS	German Social Economic Panel Study (GSOEP)	DIW Berlin

Germany	2000	LIS	German Social Economic Panel Study (GSOEP)	DIW Berlin
Germany	2004	LIS	German Social Economic Panel Study (GSOEP)	DIW Berlin
Greece	1995	LIS	Household Income and Living Conditions Survey/ GR ECHP	Hellenic Statistical Authority (ELSTAT)
Greece	2000	LIS	Household Income and Living Conditions Survey/ GR ECHP	Hellenic Statistical Authority (ELSTAT)
Greece	2004	LIS	Survey on Income and Living Conditions / EU- SILC 2005 survey	Hellenic Statistical Authority (ELSTAT)
Greece	2007	LIS	Survey on Income and Living Conditions / EU- SILC 2008 survey	Hellenic Statistical Authority (ELSTAT)
Greece	2010	LIS	Survey on Income and Living Conditions / EU- SILC 2011 survey	Hellenic Statistical Authority (ELSTAT)
Ireland	1994	LIS	Living in Ireland Survey / IE ECHP	The Economic and Social Research Institute
Ireland	1995	LIS	Living in Ireland Survey / IE ECHP	The Economic and Social Research Institute
Ireland	1996	LIS	Living in Ireland Survey / IE ECHP	The Economic and Social Research Institute
Ireland	2010	LIS	Survey on Income and Living Conditions / EU-SILC	Central Statistics Office Ireland
Italy	1987	LIS	Survey on Household Income and Wealth (SHIW)	Bank of Italy
Italy	1989	LIS	Survey on Household Income and Wealth (SHIW)	Bank of Italy
Italy	1991	LIS	Survey on Household Income and Wealth (SHIW)	Bank of Italy
Italy	1993	LIS	Survey on Household Income and Wealth (SHIW)	Bank of Italy
Italy	1995	LIS	Survey on Household Income and Wealth (SHIW)	Bank of Italy
Italy	1998	LIS	Survey on Household Income and Wealth (SHIW)	Bank of Italy
Italy	2000	LIS	Survey on Household Income and Wealth (SHIW)	Bank of Italy
Italy	2008	LIS	Survey on Household Income and Wealth (SHIW)	Bank of Italy
Italy	2010	LIS	Survey on Household Income and Wealth (SHIW)	Bank of Italy
Luxembourg	1985	LIS	Socio Economic Panel (PSELL)	CEPS/INSTEAD
Luxembourg	1991	LIS	Socio Economic Panel (PSELL)	CEPS/INSTEAD
Luxembourg	1994	LIS	ECHP	CEPS/INSTEAD
Luxembourg	1997	LIS	ECHP	CEPS/INSTEAD
Luxembourg	2000	LIS	ECHP	CEPS/INSTEAD
Luxembourg	2007	LIS	Panel socio-économique "Liewen zu Letzebuerg" (PSELL III) / Survey on Income and Living Conditions (EU-SILC)	CEPS/INSTEAD
Luxembourg	2010	LIS	Panel socio-économique "Liewen zu Letzebuerg" (PSELL III) / Survey on Income and Living Conditions (EU-SILC)	CEPS/INSTEAD

## Extreme working hours

Netherlands	1990	LIS	Additional Enquiry on the Use of (Public) Services (AVO)	Statistics Netherlands
Netherlands	1993	LIS	Socio-Economic Panel Survey	Statistics Netherlands
Netherlands	1999	LIS	Socio-Economic Panel Survey	Statistics Netherlands
Netherlands	1987	LIS	Additional Enquiry on the Use of (Public) Services (AVO)	Statistics Netherlands
Spain	1995	LIS	Spanish European Community Household Panel / ES ECHP	The National Statistics Institute
Spain	2000	LIS	Spanish European Community Household Panel / ES ECHP	The National Statistics Institute
Spain	2004	LIS	Encuesta de Condiciones de Vida (ECV) / Survey on Income and Living Condition (EU-SILC) 2005 survey	The National Statistics Institute
Spain	2010	LIS	Encuesta de Condiciones de Vida (ECV) / Survey on Income and Living Condition (EU-SILC) 2010 survey	The National Statistics Institute
Sweden	1992	LIS	Income Distribution Survey (HINK)	Statistics Sweden
Sweden	1995	LIS	Income Distribution Survey (HINK)	Statistics Sweden
Switzerland	1992	LIS	Swiss Poverty Survey	Swiss Federal Statistical Office
Switzerland	2000	LIS	Income and Consumption Survey (EVE/ERC)	Swiss Federal Statistical Office
Switzerland	2002	LIS	Income and Consumption Survey (EVE/ERC)	Swiss Federal Statistical Office
Switzerland	2004	LIS	Income and Consumption Survey (EVE/ERC)	Swiss Federal Statistical Office
UK	1979	LIS	Family Expenditure Survey (FES)	UK Data Archive
UK	1986	LIS	Family Expenditure Survey (FES)	UK Data Archive
UK	1991	LIS	Family Expenditure Survey (FES)	UK Data Archive
UK	1999	LIS	Family Resources Survey (FRS)	UK Data Archive
UK	2004	LIS	Family Resources Survey (FRS)	UK Data Archive
UK	2007	LIS	Family Resources Survey (FRS)	UK Data Archive
UK	2010	LIS	Family Resources Survey (FRS)	UK Data Archive
US	1974	LIS	Current Population Survey (CPS) – March Supplement	U.S. Census Bureau
US	1986	LIS	Current Population Survey (CPS) – March Supplement	U.S. Census Bureau
US	1991	LIS	Current Population Survey (CPS) – March Supplement	U.S. Census Bureau
US	1994	LIS	Current Population Survey (CPS) – March Supplement	U.S. Census Bureau
US	1997	LIS	Current Population Survey (CPS) – March Supplement	U.S. Census Bureau
US	2000	LIS	Current Population Survey (CPS) – March Supplement	U.S. Census Bureau
US	2004	LIS	Current Population Survey - ASEC (Annual Social and Economic Supplement)	U.S. Census Bureau

US	2007	LIS	Current Population Survey - ASEC (Annual Social and Economic Supplement)	U.S. Census Bureau
US	2010	LIS	Current Population Survey - ASEC (Annual Social and Economic Supplement)	U.S. Census Bureau
Austria	1992	MTUS	National time use survey	Statistics Austria
Canada	1992	MTUS	National time use survey	Statistics Canada
Canada	1998	MTUS	National time use survey	Statistics Canada
Denmark	2001	MTUS	National time use survey	Statistics Denmark
France	1998	MTUS	National time use survey	National Institute of Statistics and Economic Studies (INSEE)
Germany	1991	MTUS	National time use survey	German federal statistical office
Germany	2001	MTUS	National time use survey	German federal statistical office
Ireland	2009	MTUS	National time use survey	Central Statistics Office Ireland
Italy	2002	MTUS	National time use survey	Italian National Statistical Institute (ISTAT)
Netherlands	1975	MTUS	National time use survey	Statistics Netherlands
Netherlands	1980	MTUS	National time use survey	Statistics Netherlands
Netherlands	1990	MTUS	National time use survey	Statistics Netherlands
Netherlands	1995	MTUS	National time use survey	Statistics Netherlands
Netherlands	2000	MTUS	National time use survey	Statistics Netherlands
Netherlands	2005	MTUS	National time use survey	Statistics Netherlands
Norway	1981	MTUS	National time use survey	Statistics Norway
Norway	2000	MTUS	National time use survey	Statistics Norway
Spain	2009	MTUS	National time use survey	Instituto Nacional de Estadística of Spain
UK	1974	MTUS	National time use survey	UK Office for National Statistics (ONS)
UK	1987	MTUS	National time use survey	UK Office for National Statistics (ONS)
UK	2000	MTUS	National time use survey	UK Office for National Statistics (ONS)
UK	2005	MTUS	National time use survey	UK Office for National Statistics (ONS)
USA	1985	MTUS	National time use survey	U.S. Bureau of Labor Statistics
USA	1992	MTUS	National time use survey	U.S. Bureau of Labor Statistics
USA	1998	MTUS	National time use survey	U.S. Bureau of Labor Statistics
USA	2003	MTUS	National time use survey	U.S. Bureau of Labor Statistics



## Appendix C: Summary of the data and sources of the main explanatory and control variables

- *Labor market regulation*: Composite index of the strictness of labor market regulation; higher scores indicate looser labor market regulation; Fraser Institute's 2013 Economic Freedom of the World Indicators Report; weighted average of the following sub-components:
  - "Difficulty of hiring index" – sourced from World Bank's Doing Business data; countries with more flexible employment regulations are given higher standardized scores;
  - Hiring and firing regulations – sourced from World Economic Forum's Global Competitiveness Report; countries with more flexible labor regulations are given higher standardized scores;
  - Centralized collective bargaining - sourced from World Economic Forum's Global Competitiveness Report; countries with less centralized wage bargaining processes were given higher standardized scores;
  - "Rigidity of Hours index" – sourced from World Bank's Doing Business data; countries with less rigid working hour rules were given higher standardized scores;
  - Mandated cost of worker dismissal – sourced from World Bank's Doing Business data on the cost of requirements for advance notice, severance payments, and penalties due when dismissing a worker with tenure of ten years; countries with lower cost of worker dismissal were given higher standardized scores.
- *Part-time employment*: Part-time employment (as % of total employment); World Bank's World Development Indicators 2014



- *Controls of the movement of capital and people*: Composite index of economic globalization; higher scores indicate less controls; Fraser Institute's 2013 Economic Freedom of the World Indicators Report; it is a weighted average of the following sub-components:
  - *Foreign ownership/investment restrictions* – sourced from World Economic Forum's Global Competitiveness Report; countries with higher penetration of foreign ownership and less restrictive investment restriction were given higher scores;
  - *Capital controls* – sourced from IMF, Annual Report on Exchange Arrangement and Exchange Restrictions; countries with weaker capital controls were given higher scores
  - *Freedom of foreigners to visit* – sourced from Robert Lawson and Jayme Lemke, Travel Visas, Public Choice (2011)
- *Openness of the economy (measured as total trade)*: Openness of the economy, measured as total trade (sum of import and export) as a percentage of GDP, in current prices; Armingeon Comparative Political Dataset 2013; originally sourced from Heston, Alan, Robert Summers and Bettina Aten (2012), Penn World Table Version 7.1
- *Services (% of GDP)*: Services, value added (as % of GDP); World Bank's World Development Indicators:
- *Real GDP growth*: Armingeon Comparative Political Dataset 2013: Growth of real GDP, percent change from previous year; originally sourced from OECD (2012), "OECD Economic Outlook No. 92", OECD Economic Outlook: Statistics and Projections
- *Productivity*: GDP per hour worked, USD constant 2005, PPP, OECD labour statistics

Figure 1 consists of two side-by-side scatter plots, both titled "Extremes vs. productivity".

The left plot has a y-axis labeled "Ratio of extremes" ranging from 0% to 40% in 5% increments. The x-axis is labeled "GDP per hour worked, constant USD, PPP" and ranges from 20 to 70 in increments of 10. A horizontal regression line is drawn at approximately 10%. Data points are labeled with country codes and years, such as UK'74, GR'95, AT'92, CA'98, US'98, UK'00, US'92, US'03, NL'95, NL'90, NL'05, LU'94, NO'00, UK'05, DE'01, NL'00, LU'07, and others. The data points are scattered around the 10% line, with some outliers above and below.

The right plot has a y-axis ranging from 0% to 20% in 5% increments. The x-axis is labeled "GDP per hour worked, constant USD, PPP" and ranges from 20 to 60 in increments of 10. A downward-sloping regression line is drawn. Data points are labeled with country codes and years, such as GR'00, IE'96, ES'00, UK'04, DE'00, BE'00, US'00, NL'99, FR'00, SE'95, AT'04, DK'01, LU'00, and others. The data points show a clear downward trend as GDP per hour worked increases.

Both plots include a data source note at the bottom: "Data source: Author's meta-database on extreme working hours & OECD". The right plot also includes a note: "Note: 1 observation per country closest to year 2000 is depicted, only LIS observations are included".



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